REMARKS/ARGUMENTS

The office action of April 21, 2005, has been carefully reviewed and these remarks are responsive thereto. Claims 12 and 32 have been amended to clarify the scope of protection. Claims 18-25 and 43-50 have been canceled. Claims 51-52 have been added. Claims 1-17, 26-42, and 51-52 remain pending. Reconsideration and allowance of the instant application are respectfully requested.

Initially, Applicants thank the Examiner for the indication that claims 3-13, 17, 28-38, and 41-42 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims, and, with respect to claims 3-13, and 17, if rewritten to overcome the rejection(s) under 35 U.S.C. § 112, second paragraph.

Per the suggestion of the Examiner, Applicants have made minor amendments to claims 12 and 32 to further clarify the scope of protection. With these amendments, Applicants believe the objection to each should be withdrawn.

Claims 1-17 stand rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Specifically, the Action alleges that, for claim 1, "[i]t is unclear in the claim language exactly where the 'determining complex channel state information based on the received space-time coded signals' takes place." Applicants respectfully traverse this rejection.

Applicants' original written description describes various illustrative embodiments for the different features of claim 1. In particular, Applicants' original written description describes at least two embodiments for Applicants' claim 1 feature of, "determining complex channel state information based on the received space-time coded signals." For example, page 32, lines 13-25, of Applicants' original written description describes one such embodiment. "Signal measurement circuit 238 and processor 240 and control modules described herein constitute a circuit by which remote station 230 determines channel state information based on the received first and second signals and segments the channel state information into a plurality of channel state information segments." (Original written description, page 32, lines 17-20). A second embodiment is

described in the paragraph from page 47, line 25, to page 48, line 8. "In FIG. 30, a remote station using feedback process S240 measures down link complex channel state information and feeds this information back to the base station." (Original written description, page 47, lines 25-26). As such, Applicants have described multiple embodiments of different components for performing the features of Applicants' independent claim 1. As such, Applicants have not limited claim 1 to a particular device, component, or structure. In response, Applicants respectfully request withdrawal of the present rejection.

In order to further develop the scope of protection of the claims, Applicants have added new claims 51-52. Support for the new claims may be found throughout Applicants' original written description and drawings, and with the additional claims, Applicants have added no new subject matter.

Claims 1-2 and 26-27 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Dabak *et al.* (U.S. Pat. No. 6,594,473, hereinafter *Dabak*). In addition, claims 15 and 40 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Dabak* as applied to claims 1 and 26, in view of Weerackody (U.S. Patent No. 5,848,103, hereinafter *Weerackody*). Applicants respectfully traverse the rejections.

Dabak is a reference with a filing date of May 24, 2000. *Dabak* claims priority to a U.S. Provisional Application No. 60/136,413 that was filed May 28, 1999. For the convenience of the Examiner, Applicants include a copy of U.S. Provisional Application Serial No. 60/136,413 as it was obtained from the Public PAIR website at the U.S. Patent and Trademark Office website as Appendix A. With respect to claims 1-2, 15, 26-27, and 40, Applicants rely on the same Declaration of the Inventors under 37 C.F.R. § 1.131 filed in the present matter on November 2, 2004, to establish a date of inventorship prior to May 24, 2000, the filing date of the *Dabak* reference.

In the declaration of the inventors under 37 C.F.R. § 1.131 filed on November 2, 2004, the inventors established a date of conception prior to at least February 15, 2000, and diligence to filing a patent application on June 2, 2000. Presently rejected claims 1-2, 15, 26-27, and 40 were included within that declaration. The current Office Action mailed April 21, 2005, states that the "affidavit filed on 02 November 2004 under 37 CFR 1.131 is sufficient to overcome the Hottinen

reference." As the declaration of the inventors established a date of invention prior to at least February 15, 2000, the Action cannot rely on *Dabak* alone to reject claims 1-2, 15, 26-27, and 40. Instead, support for the subject matter relied on in *Dabak* must be found in the original provisional application to which *Dabak* claims priority.

May 28, 1999, is the filing date of *Dabak*'s related U.S. Provisional Application No. 60/136, 413 (hereinafter "*Dabak provisional*"). A copy of the *Dabak provisional* is attached as Appendix A. Thus, in order to anticipate claims 1-2, 15, 26-27, and 40 of the present application, any subject matter cited in *Dabak* must be fully supported (i.e. disclosed) in the *Dabak provisional*. Applicants submit that the *Dabak provisional* fails to provide support for substantial material cited in the office action. In particular, the *Dabak provisional* fails to teach or suggest at least Applicants' claim 1 features of, "determining complex channel state information based on the received space-time coded signals; and sending the complex channel state information to the first station," and Applicants' claim 26 features of, "a processor to determine complex channel state information from the received space-time coded signals; and a transmitter to send the complex channel state information to a base station." As a result, portions of the subject matter relied upon in *Dabak* are not prior art, and therefore do not preclude patentability under 35 U.S.C. § 102(e) and/or 103(a). As such, *Dabak* alone, or in combination with the *Dabak provisional*, is not adequate prior art with respect to Applicants' claims 1-2, 15, 26-27, and 40. With respect to claims 15 and 40, *Weerackody* fails to cure the deficiencies of *Dabak*. Applicants respectfully request withdrawal of the present rejection in response.

Claims 14 and 39 stand rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over *Dabak*. Applicants respectfully traverse this rejection.

Based on the 37 C.F.R. § 1.131 Declaration of the inventors, Juha Ylitalo and Marcos Katz, submitted concurrently herewith, Applicants antedate *Dabak*, with respect to Applicants' claims 14 and 39, by establishing a date of invention prior to the filing date, May 24, 2000, of the *Dabak* reference. In addition, Applicants submit that the *Dabak provisional* fails to provide support for the subject matter cited in the office action. In particular, the *Dabak provisional* fails to teach or suggest at least Applicants' claim 14 feature of, "the first and second signature codes

being substantially orthogonal so that a second station can separate a composite signal into the first and second space-time coded signals," and Applicants' claim 39 feature of, "the first and second signature codes being substantially orthogonal so that the remote station can separate a composite signal into the first and second space-time coded signals." As a result, portions of the subject matter relied upon in *Dabak* are not prior art, and therefore do not preclude patentability under 35 U.S.C. § 102(e) or 103(a).

The rejection is mooted by the filing of the attached declaration and failure of the *Dabak provisional* to support the subject matter identified in Action; however, should the declaration fail to satisfy the requirements to antedate the *Dabak* reference, Applicants reserve the right to traverse the *Dabak* reference on the merits. Accordingly, Applicants submit that *Dabak* does not constitute prior art to the rejected claims. Applicants respectfully request withdrawal of the rejection under 35 U.S.C. § 102(e) or, in the alternative, under 35 U.S.C. § 103(a).

CONCLUSION

All rejections having been addressed, Applicants respectfully submit that the instant application is in condition for allowance, and respectfully solicit prompt notification of the same. Should the Examiner find that a telephonic or personal interview would expedite passage to issue of the present application, the Examiner is encouraged to contact the undersigned attorney at the telephone number indicated below. No fee is believed due, however, if any fees are required or if an overpayment has been made the Commissioner is authorized to charge or credit Deposit Account No. 19-0733. Applicants look forward to passage to issue of the present application at the earliest convenience of the Office.

Respectfully submitted,
BANNER & WITCOFF, LTD.

Date: July 20, 2005

By: _____
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APPENDIX A

(Copy of U.S. Provisional Application No. 60/136,413 – 3 pages – Retrieved from the Public PAIR website on the U.S. Patent and Trademark Office website)

PROVISIONAL APPLICATION UNDER 37 C.F.R. §1.53(c)

M1 PKUV

TRANSMITTAL FORM

Docket Number: TI-29286PS

Assistant Commissioner For Patents

Washington, D.C. 20231

"EXPRESS MAIL" Express Mailing Label Number *EL008142265US*, Date of Deposit: *May 28, 1999*. I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to the Assistant Commissioner For Patents, Washington, DC 20231.

ELIZABETH AUSTIN

Dear Sir:

Enclosed application parts are:

__	Spec w/Claims	Number of Pages	___
X	Spec w/o Claims	Number of Pages	2
__	Formal drawings	Number of Sheets	___
__	Informal drawings	Number of Sheets	___
__	Other:		

Inventors:

LAST NAME	FIRST NAME	MIDDLE INITIAL	RESIDENCE (CITY & STATE OR CITY & FOREIGN COUNTRY)
DABAK	*ANAND*	*G.*	*Richardson, Texas*
HOSUR	*SRINATH*		*Dallas, Texas*

TITLE OF INVENTION: COMBINED STTD AND TxAA FOR MORE THAN 2 ANTENNAS

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Was this invention made under a Government contract? X No __ Yes

Identify contract and the Government agency: _____

Please charge $150 to Deposit Account No. 20-0668. An original and two copies are enclosed.

Respectfully submitted,

Ronald O. Neerings
Reg. No. 34,227

5/28/99
Date

PROVISIONAL APPLICATION ONLY

Combined STTD and TxAA for more than 2 antennas

Anand Dabak, Srinath Hosur

The antenna diversity schemes for more than 2 antennas is still under study. One can use a transmit adaptive array (TxAA) for more than 2 antennas. But that will need more feedback bandwidth, which may or may not be available. In this contribution, we propose to combined the space time block coded transmit antenna diversity (STTD) with the TxAA. The case we consider is for 4 antennas, but more than 4 antennas can also be easily generalized. The figure below shows the STTD for 2 antennas.

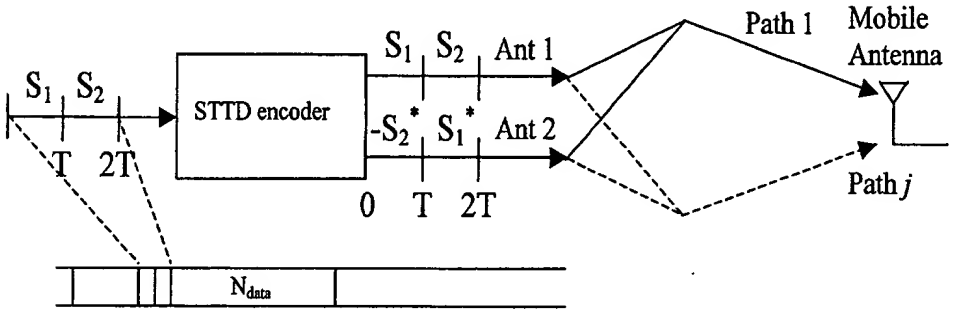

Figure (1): STTD for two antennas

Let us now consider the case if there are four antennas to transmit. We propose that we can use the following structure:

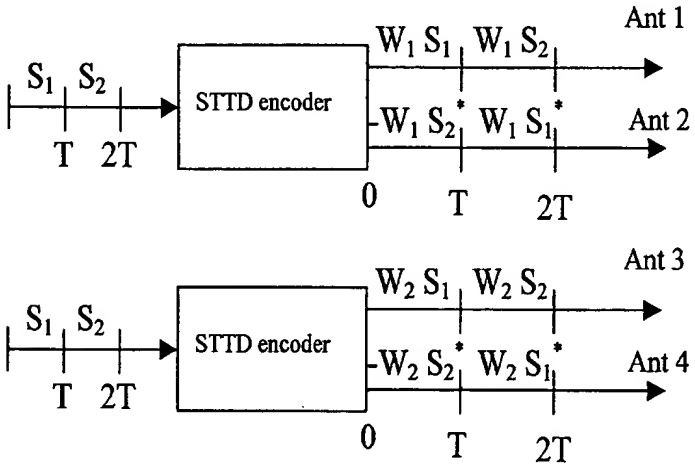

Figure (2): STTD + TxAA for four antennas

In the figure (2) we can see that across antenna pairs 1,2 and 3, 4 we have used STTD and across antenna groups of (1, 2) and (3, 4) we have used transmit adaptive array

(TxAA). The mobile will need to calculate and send back the optimum antenna weights W_1 and W_2. They are calculated as follows;

Let $\overline{W} = \begin{bmatrix} W_1 \\ W_2 \end{bmatrix}$ and $H_1 = [h_1 \quad h_3]$ and $H_2 = [h_2 \quad h_4]$ be channel impulse response matrices. The h_i is the channel impulse response matrix for antenna i in figure (2). Thus, for example if there are a total of N resolvable multi-paths from the base station to the mobile, we will have

$$h_i = \begin{bmatrix} \alpha_i^1 \\ \alpha_i^2 \\ \\ \alpha_i^N \end{bmatrix}$$

Then the mobile calculates the weight vector that maximizes;

$\overline{W}^H \left(H_1^H H_1 + H_2^H H_2 \right) \overline{W}$ ----------(1)

and sends the information back to the mobile. For simplicity, let us say that there is only one multi-path from the base station to the mobile implying that $N = 1$. In that case the mobile receives the following two symbols after despreading:

$$r^1 = W_1\left(\alpha_1^1 S_2 + \alpha_2^1 S_1^*\right) + W_2\left(\alpha_3^1 S_2 + \alpha_4^1 S_1^*\right) + N_1$$
$$r^2 = W_1\left(\alpha_1^1 S_1 - \alpha_2^1 S_2^*\right) + W_2\left(\alpha_3^1 S_1 - \alpha_4^1 S_2^*\right) + N_2$$

where N_1 *and* N_2 are AWGN.

We now get;

$$r^1 = S_2\left(W_1\alpha_1^1 + W_2\alpha_3^1\right) + S_1^*\left(W_1\alpha_2^1 + W_2\alpha_4^1\right) + N_1$$
$$r^2 = S_1\left(W_1\alpha_1^1 + W_2\alpha_3^1\right) - S_2^*\left(W_1\alpha_2^1 + W_2\alpha_4^1\right) + N_2$$ ----------(2)

Letting $\tilde{\alpha} = \left(W_1\alpha_1^1 + W_2\alpha_3^1\right), \tilde{\beta} = \left(W_1\alpha_2^1 + W_2\alpha_4^1\right)$ we can see that the above equation (1) is in the form of standard STTD implying that the total SNR for each symbol S_1 and S_2 after STTD decoding will be;

$$\frac{\left|\left(W_1\alpha_1^1 + W_2\alpha_3^1\right)\right|^2 + \left|\left(W_1\alpha_2^1 + W_2\alpha_4^1\right)\right|^2}{\sigma^2}$$ ----------(3)

It can be easily seen that the maximization in equation (1) indeed maximizes the received SNR in equation (3) above. We can thus obtain the antenna diversity while maximizing the received SNR in equation (3). The advantages of the above scheme are as follows;

(1) We achieve a *2N* path diversity where *N* is the number of paths from the base station to the mobile.
(2) We achieve a 3 dB gain in average SNR due to TxAA across the two antenna groups (1, 2) and (3, 4)
(3) The required reverse link bandwidth is that corresponding to only two antennas.

The mobile processing for receiving data for figure (2) will be the standard STTD decoding for each of the symbols S_1, S_2.